mark : $\frac{23.5}{25}$ قياسات كهربائية 23.5 MW 9.30 - 11.00

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Q1 **Drift** : it is ~~Undes~~ undesired change in the output - input relationship over aperiod of time.

تعريفات

Resolution : it is the smallest change in the measured value on which the instrument will respond.

(6)

Q2 $50 \frac{mile}{hour}$ Convert from mile/hour to : ⓐ km/hr ⓑ ft/s

a- $50 \frac{mile}{hour} \times \frac{1.609\ km}{1\ mile} = 80.45\ km/hr$

b- ① $50 \frac{mile}{hour} \times \frac{1609\ m}{1\ mile} \times \frac{1\ hour}{3600\ s} = 22.34\ m/s$

② $22.34 \frac{m}{Second} \times \frac{1\ ft}{0.3048\ m} = 73.29\ ft/s$

(6)

Q3 ⓐ $E = \frac{V}{L} = \frac{ML^2T^{-3}I^{-1}}{L} = MLT^{-3}I^{-1}$

derivation

ⓑ Unit of electric field strength = V/m

(3)

سؤال 3

ⓐ Dimension و ⓑ الوحدة أوجد

لوحدة المجال الكهربائي (E)

ⓐ average range of error

σ^2

Variance / Probable error / σ / average of deviation   اوجد :

ⓔ ⓓ ⓒ ⓑ

Q5

1000.2 Ω, 1000.8 Ω, 999.2 Ω, 999.5 Ω, 999.0 Ω, 1000.6 Ω, 1000.0

$$E_{av} = \frac{1000.2 + 1000.8 + 999.2 + 999.5 + 999.0 + 1000.6 + 1000.0}{7}$$

$$= \boxed{999.9}\ \Omega$$

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a the average range of error

$X = E_{max} - E_{av} = 1000.8 - 999.9 = \boxed{0.9}\ \Omega$

$Y = E_{av} - E_{min} = 999.9 - 999.0 = \boxed{0.9}$

∴ average range of error $= \frac{X + Y}{2} = \frac{0.9 + 0.9}{2} = \frac{1.8}{2} = \boxed{0.9}\ \Omega$

4.5

$d_1 = x_1 - \bar{x} = 1000.2 - 999.9 = \boxed{0.3} \Rightarrow d^2 = \boxed{0.09}$

$d_2 = x_2 - \bar{x} = 1000.8 - 999.9 = \boxed{0.9} \Rightarrow d^2 = \boxed{0.81}$

$d_3 = x_3 - \bar{x} = 999.2 - 999.9 = \boxed{-0.7} \Rightarrow d^2 = \boxed{0.49}$

$d_4 = x_4 - \bar{x} = 999.5 - 999.9 = \boxed{-0.4} \Rightarrow d^2 = \boxed{0.16}$

$d_5 = x_5 - \bar{x} = 999.0 - 999.9 = \boxed{-0.9} \Rightarrow d^2 = \boxed{0.81}$

$d_6 = x_6 - \bar{x} = 1000.6 - 999.9 = \boxed{0.7} \Rightarrow d^2 = \boxed{0.49}$

$d_7 = x_7 - \bar{x} = 1000.0 - 999.9 = \boxed{0.1} \Rightarrow d^2 = \boxed{0.01}$

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b averge deviation $= \frac{|d_1| + |d_2| + |d_3| + |d_4| + |d_5| + |d_6| + |d_7|}{7}$

$$= \frac{0.3 + 0.9 + 0.7 + 0.4 + 0.9 + 0.7 + 0.1}{7} = \boxed{0.57}$$

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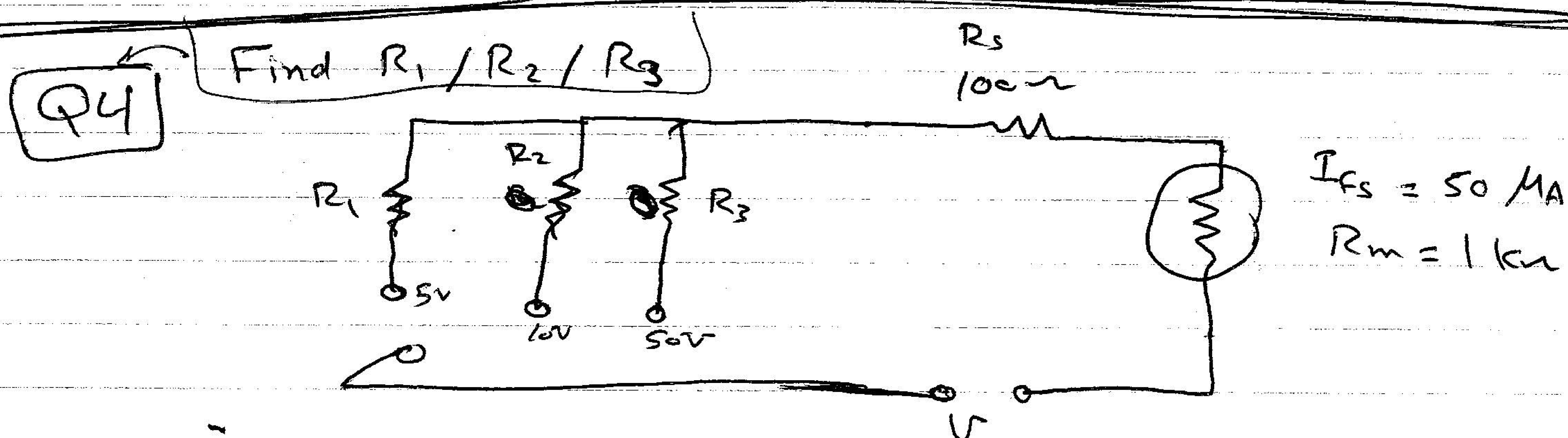
c $\sigma = \sqrt{\frac{\Sigma d^2}{n-1}} = \sqrt{\frac{2.86}{7-1}} = \sqrt{\frac{2.86}{6}} = \boxed{0.69}$

d) probable error $= 0.6745(\sigma) = 0.6745(0.69)$

$= \boxed{0.465}$

e) Variance $= \sigma^2 = (0.69)^2 = \boxed{0.4761}$

Q4) Find $R_1 / R_2 / R_3$



This is a DC Voltmeter

at 50 V

$R_3 = \frac{V}{I_m} - R_s = \frac{50}{50\ \mu A} - (100\Omega + 1k\Omega) = \boxed{998.9\ k\Omega}$

at 10V

$R_2 = \frac{V}{I_m} - R_s = \frac{10}{50\ \mu A} - (100\Omega + 1k\Omega) = \boxed{198.9\ k\Omega}$

6

at 5V

$R_1 = \frac{V}{I_m} - R_s = \frac{5}{50\ \mu A} - (100\Omega + 1k\Omega)$

$= \boxed{98.9\ k\Omega}$